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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.   | CONFIRMATION NO. |
|--|-------------|----------------------|-----------------------|------------------|
| 10/626,730   | 07/25/2003  | Raymond Kwong        | 10052/4001            | 9704             |
| 23838  | 7590        | 06/29/2005           | EXAMINER              |                  |
| KENYON & KENYON<br>1500 K STREET NW<br>SUITE 700<br>WASHINGTON, DC 20005 |             |                      | YAMNITZKY, MARIE ROSE |                  |
|  |             |                      | ART UNIT              | PAPER NUMBER     |
|  |             |                      | 1774                  |                  |

DATE MAILED: 06/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/626,730

Applicant(s)

KWONG ET AL.

Examiner

Marie R. Yamnitzky

Art Unit

1774

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 Jul 2003, 31 Oct 2003 and 04 Apr 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date rec'd 31 Oct 2003 and 04 Apr 2005.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

1. Claims 24-26 and 35-37 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 24-26 and 35-37 limit the relationship between the lowest unoccupied molecular orbital energy level of the organic enhancement material and the lowest occupied molecular orbital energy level of the hole transporting material in the first organic layer. The specification does not enable one to make the invention as claimed in claims 24-26 and 35-37.

Other than in the last sentence in paragraph [0007], the specification describes selection of materials based on a comparison of highest occupied molecular orbitals and/or a comparison of lowest unoccupied molecular orbitals, but not a comparison of lowest unoccupied to lowest occupied. Although the last sentence in paragraph [0007] provides antecedent basis for the limitations of claims 24-26 and 35-37, no further information is provided as to how to make and/or use this embodiment of the invention.

2. Claims 1-37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 21 and 27 recite "in direct contact with". Paragraph [0006] of the present specification teaches that unless it is specified that the first layer is "in physical contact with" the

second layer, there may be other layers between the first and second layer. It is not clear if the claim recitation of "in direct contact with" has the same meaning as "in physical contact with".

Claims 1, 3, 11-13 and 27 set forth " $\text{CF}_3$ " and " $\text{C}_n\text{F}_{2n+1}$ " as possible substituents, but do not explicitly define the subscript "n". It is not clear if there is any limit on "n". (If there is no specific limit on "n", the examiner suggests using the term "perfluoroalkyl" instead of " $\text{C}_n\text{F}_{2n+1}$ ". Also, presuming no limit on "n" and/or that "n" may be 1, the recitation of " $\text{CF}_3$ " is superfluous.)

It is not clear if a material of Formula IX as set forth in claim 12 is within the scope of a material of Formula I as defined in claim 1 because claim 1 does not explicitly allow ring A to form a ring structure with  $\text{R}_6$ . It is not clear if the organic enhancement layer of claim 12 comprises at least two materials, at least one of Formula I and at least one of Formula IX, or if claim 1 (and other claims containing formulae with variables) should be interpreted as allowing at least two variables to join together to form a ring.

The limitations imposed by claims 17 and 18 are not clear because the conditions for determining the fluorescence peak are not specified. As is known in the art, the fluorescence peak of a material may shift when measured under different conditions, such as when in a solution versus when in the form of a film, and when in different solvents if measured in solution. It is not clear if the fluorescence peak is the peak of the material as present in the device (i.e. in film form).

The limitations imposed by claims 19 and 20 are not clear because it is not clear how thermal stability is measured. For example, is a device considered to be thermally stable up to at least about  $330^\circ\text{C}$  if the device is capable of emitting light while in an environment of  $330^\circ\text{C}$ ,

even if device performance may differ from that exhibited in an environment of less than 330 °C? It is not clear if these claims require that any specific test(s) be used to determine whether a particular device is thermally stable.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 2, 21, 23, 27-30, 32 and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by Aziz et al. (US 6,392,250 B1).

Aziz discloses a device comprising an anode, a cathode and, between the anode and cathode, a mixed region and an electron transport region. For example, the device depicted in Fig. 2 of the Aziz patent comprises anode 34, mixed region 38, electron transport region 40, and cathode 42. The mixed region comprises a hole transport material, an electron transport material, and an emitter. The electron transport region comprises an electron transport material.

As taught in the paragraph bridging columns 11 and 12, the emitter in the mixed region may be a phosphorescent material such as PtOEP or Ir(ppy)<sub>3</sub>. As taught in column 10, the electron transport region may be made of a material of present Formula I, which has a ligand

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having the present structure (II). Each of the metal complexes specifically named at column 10, lines 15-45 of the patent, except for the zinc complex comprising 2-hydroxynaphthyl which is named at l. 36-37, meets the limitations of a material of Formula I as defined in present claim 1, and has a ligand having the structure (II) as defined in present claim 27. The zinc complex comprising 2-hydroxynaphthyl also meets the limitations of a material of Formula I and a material comprising a ligand having structure (II) if claims 1 and 27 are interpreted as allowing at least two variables to join together to form a ring.

With respect to present claim 2, while the metal complexes named at c. 10, l. 15-45 of the Aziz patent have a ring A that has more than one nitrogen atom, only one nitrogen atom of ring A is coordinated to the metal M.

With respect to present claim 30, the list at c. 10, l. 15-45 includes zinc complexes.

With respect to present claim 32, the list at c. 10, l. 15-45 includes complexes having a ligand having structure (II) in which each of R<sub>3</sub>-R<sub>6</sub> is hydrogen. For example, the first four complexes named beginning at c. 10, l. 15 meet the limitations of the material required by claim 32.

5. Claims 1, 2, 21-23, 27-30, 32 and 34 are rejected under 35 U.S.C. 102(e) as being anticipated by Seo et al. (US 2003/0020088 A1).

Seo et al. describe a device comprising, in the order listed: an anode, a first organic compound layer, a second organic compound layer and a cathode.

The first organic layer comprises a phosphor, which may be a phosphorescent material such as Ir(ppy)<sub>3</sub> or PtOEP as taught, for example, in paragraph [0032]. The first organic layer may also comprise a polymer of N-vinylcarbazole (e.g. see paragraph [0031]), which is a known hole transporting material.

The zinc complexes Zn(PBO)<sub>2</sub> and Zn(PBT)<sub>2</sub> are disclosed for use in the second organic compound layer (e.g. see paragraph [0034]). Zn(PBO)<sub>2</sub> and Zn(PBT)<sub>2</sub> are materials of present Formula I as defined in present claims 1 and 2, and are materials comprising a ligand having structure (II) as defined in present claims 27-30 and 32.

With respect to present claim 22, Seo et al. teach that an insulating layer of a metallic oxide or a metallic fluoride can be provided between the cathode and the second organic compound layer (e.g. see paragraph [0115]).

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 9, 10, 22, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aziz et al. (US 6,392,250 B1) as applied to claims 1, 2, 21, 23, 27-30, 32 and 34, and further in view of Hu et al. (US 5,925,472).

With respect to present claims 9, 10, 30 and 31, Aziz's list at c. 10, l. 15-45 anticipates a material in which M is zinc. Aziz et al. teach that the metal chelates disclosed in US 5,925,472 can be used in the electron transport region 40, with the materials listed at c. 10, l. 15-45 being examples of these chelates. In US 5,925,472, Hu et al. teach that any monovalent, divalent or trivalent metal ion may be used as the metal in the chelate, with aluminum and magnesium being specifically taught. Therefore, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention, having knowledge of Hu's disclosure, to utilize metal chelates such as aluminum or magnesium chelates in the electron transport region 40 of Aziz's device. Further, with respect to present claims 9 and 10, one of ordinary skill in the art would have recognized from Hu's disclosure that when the metal is aluminum, there will be three ligands, thereby providing a material of Formula VII having one nitrogen atom coordinated to the aluminum.

With respect to present claim 22, Aziz et al. teach that the electron transport region may comprise multiple layers such as in the device depicted in Fig. 3. It would have been a *prima facie* obvious modification to one of ordinary skill in the art at the time of the invention to incorporate one or more additional electron transport layers between a layer comprising one of the metal chelates listed at c. 10, l. 15-45 and the cathode.

8. Applicant is advised that should claim 7 be found allowable, claim 11 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. Applicant is advised that should claim 27 be found allowable, claim 29 will be objected to under 37 CFR 1.75 as being a



substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim 11 is a substantial duplicate of claim 7, presuming there may be four  $R_{11}$  and four  $R_{12}$  in the Formula VIII structure. Since  $R_{11}$  and  $R_{12}$  may represent hydrogen, and there are necessarily four hydrogen on each benzene ring and each pyridine ring if no other substituents are present, the examiner presumes there may be four  $R_{11}$  and four  $R_{12}$  in the Formula VIII structure.

9. Miscellaneous:

Claims 9 and 14 are lacking a period at the end of each claim.

Some of the present claims recite the term “alkylaryl”. In light of the specification, paragraph [00049], “alkylaryl” is interpreted as referring to an alkyl group substituted with an aromatic group (rather than the conventional meaning of an aryl group substituted with an alkyl group).

Although present claims 15-20, 24-26 and 35-37 are not presently rejected as unpatentable over prior art, applicant is cautioned that this does not mean that these claims are necessarily patentable over the prior art. Rather, these claims are not presently rejected using prior art because the examiner presently has insufficient information to determine whether the claim limitations are met by the prior art and/or because the claim limitations are unclear.

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10. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (571) 272-1531. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax number for Art Unit 1774 is (703) 872-9306 for all official faxes.  
(Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (571) 273-1531.)

MRY  
June 27, 2005



**MARIE YAMNITZKY  
PRIMARY EXAMINER**

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